Analysis of the Best Disinfection Alternative for West Point

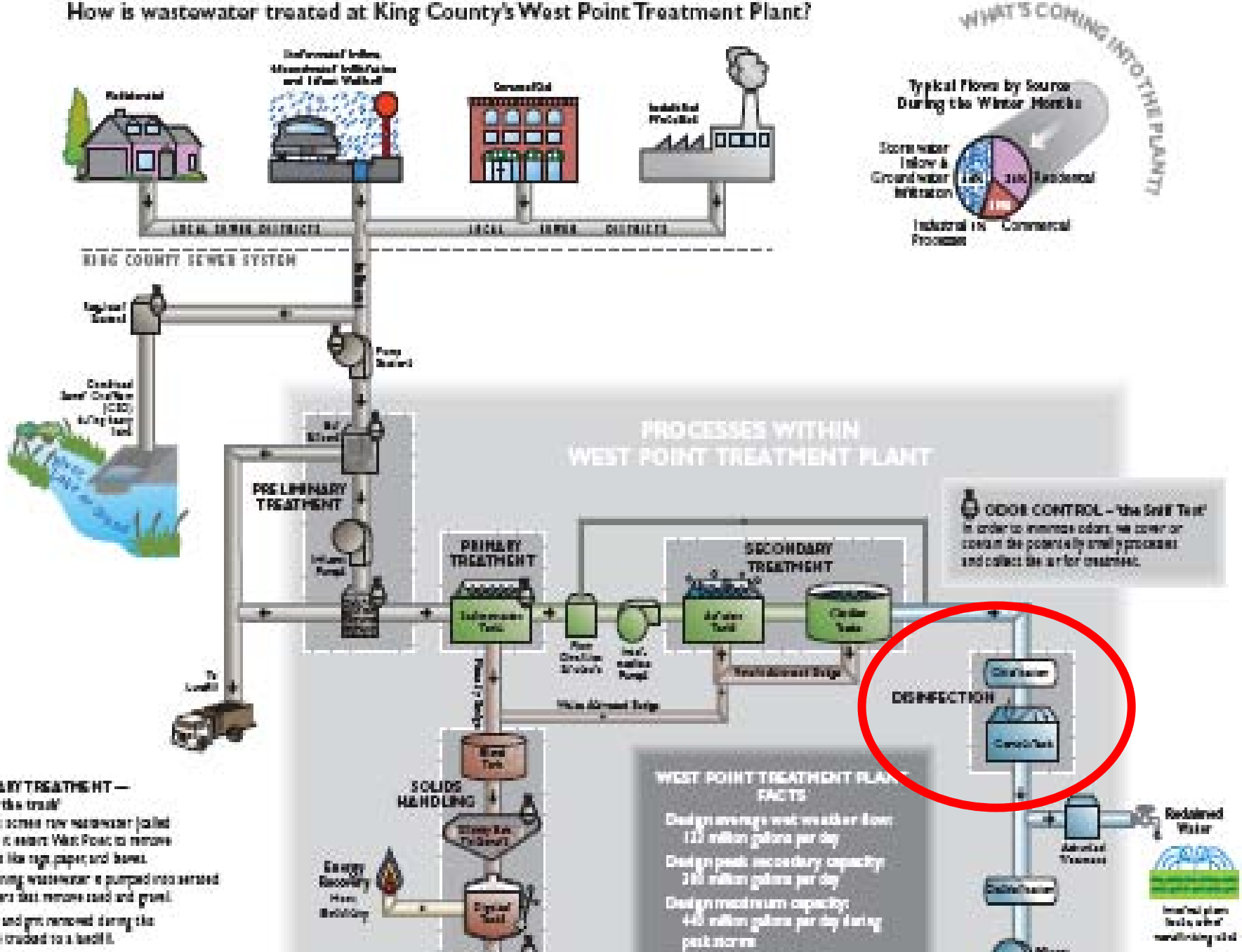
Liezl Casanova
Safety Office
Summer 2006

Why?

- Department of Homeland Security is urging wastewater treatment facilities to examine their current disinfection method
- FOCUS:
  - SAFETY, SAFETY, SAFETY
  - Safety for Workers
  - Safety for Public

WASTEWATER TREATMENT PROCESS

How is wastewater treated at King County's West Point Treatment Plant?



PRELIMINARY TREATMENT — 'Taking out the trash'

- Bar screens screen raw wastewater (called influent) as it enters West Point to remove large debris like rags, paper, and boxes.
- After screening, wastewater is pumped into aerated grit chambers that remove sand and gravel.
- The debris and grit removed during this process are trucked to a landfill.

Current Disinfection System

- At West Point we use chlorine
- Although it is effective and cheaper, chlorine poses significant hazards to human life
  - Severe irritant to eyes, nose, lungs, and skin at low concentrations
  - Exposure at high concentrations can be fatal

Cost/Benefit Analysis

- Because chlorine is so potentially damaging, WTD wants a feasible, but also safer option
- Chlorine Decision Tool
- Alternatives considered:
  - Continued use of Chlorine
  - Addition of Emergency Scrubber (Done)
  - Purchased Sodium Hypochlorite
  - On Site Generation of Sodium Hypochlorite
  - UV

Continued Chlorine Use

- Advantages
  - Effective
  - Cheaper
- Disadvantages
  - Very Hazardous
  - Byproducts created
  - Can be used in terrorist attacks

Addition of Emergency Scrubber to Existing System

- This was completed in 1996
- Although scrubbers provide significant mitigation for most accidental releases, scrubbers provide little protection against an intentional leak
- Not a sufficient, stand alone alternative

Purchased Sodium Hypochlorite

- Advantages
  - Relatively simple process
  - Much SAFER than using chlorine
  - Process of choice for many wastewater treatment facilities
- Disadvantages
  - Byproducts created

On Site Generation of Sodium Hypochlorite

- Advantages
  - Much SAFER
  - Lower costs in the long run
- Disadvantages
  - Physical renovation of plant
  - Byproducts created

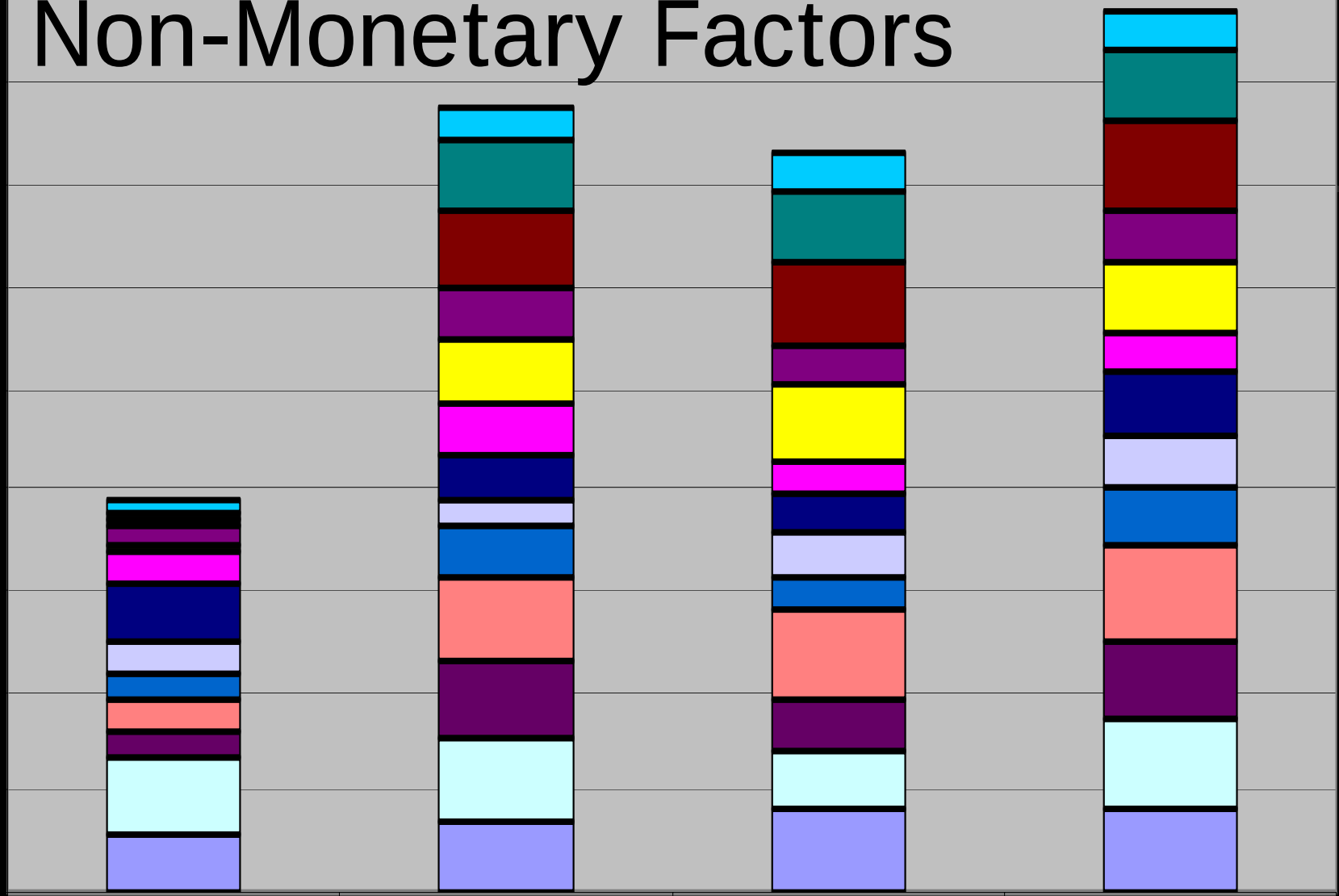
UV

- Advantages
  - Safest alternative
  - No unwanted disinfection byproducts
  - Does not materially alter effluent water quality
- Disadvantages
  - Bulbs are costly
  - Change bulbs frequently

Decision Tool Factors

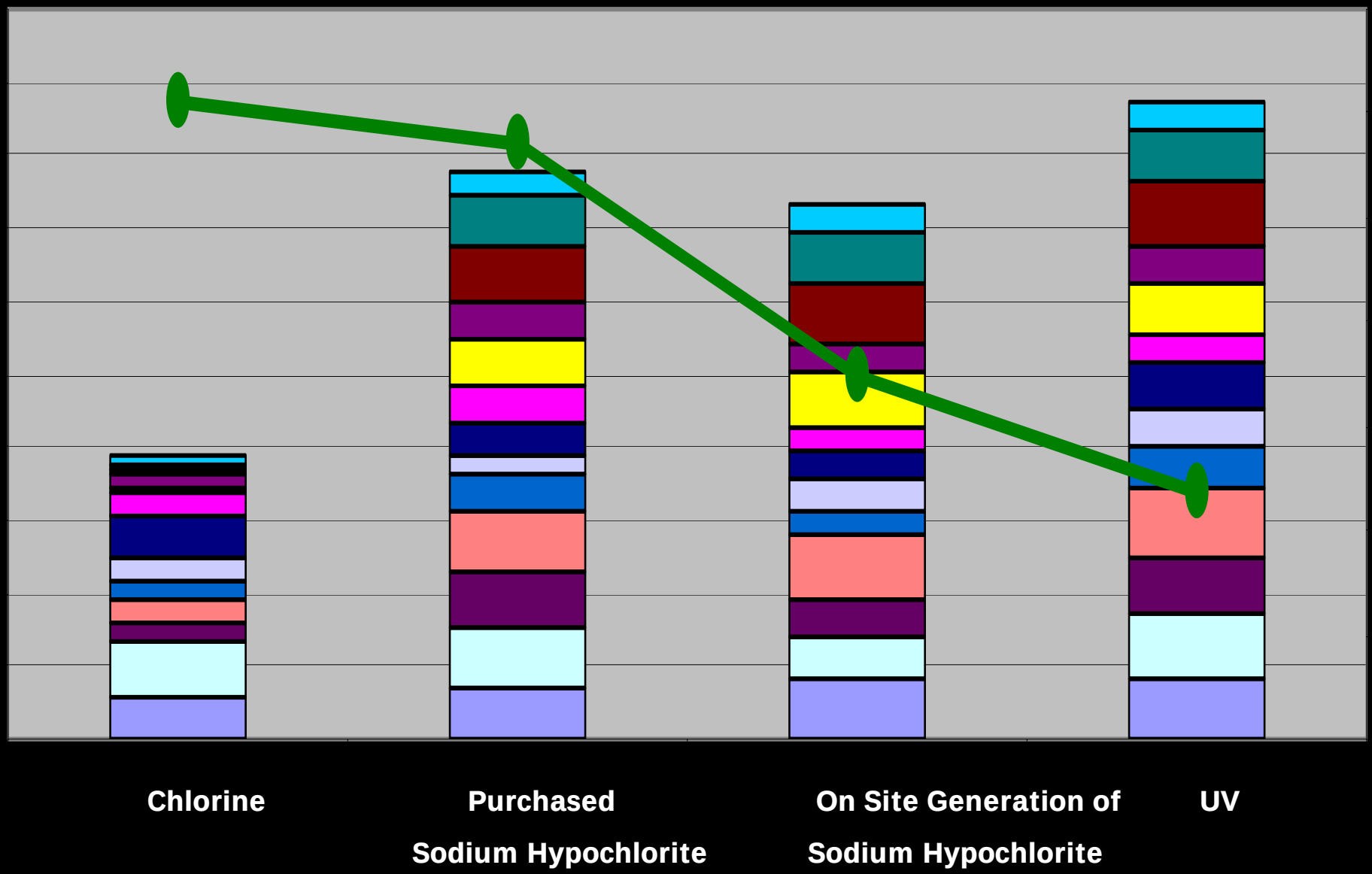
- Costs
  - **Capital**
  - **Operational**
  - **Maintenance**
- Non-monetary
  - **Meet regulations**
  - **Process reliability**
  - **Maintenance requirements**
  - **Safety for workers**
  - **Operational complexity**
  - **Traffic**
  - **Space requirements**
  - **- Security**
  - **- Neighborhood Acceptability**
  - **- Safety for public**
  - **- Regulatory relief**
  - **- How easy to contain**
  - **- Constructability**

Non-Monetary Factors



Analysis

- Based on non-monetary factors alone, UV is the best alternative
- Considering other factors such as capital and cost, UV is not the best alternative
- Necessary to look at both non-monetary and monetary factors in making decision


Chlorine
Purchased Sodium Hypochlorite
On Site Generation of Sodium Hypochlorite
UV

Results

- When non-monetary and monetary factors are considered, **purchasing sodium hypochlorite** is the best alternative
- Why?
  - SAFER
  - COST EFFECTIVE

South Plant

Conversion at South Plant—Temporary Installation

- City of Renton mandated a conversion
- Chose to purchase sodium hypochlorite
- Have utilized system for 4 years
- No accidents or leakages to date
- Workers prefer the “new” system

Pre Conversion

Pre Conversion

Pre Conversion

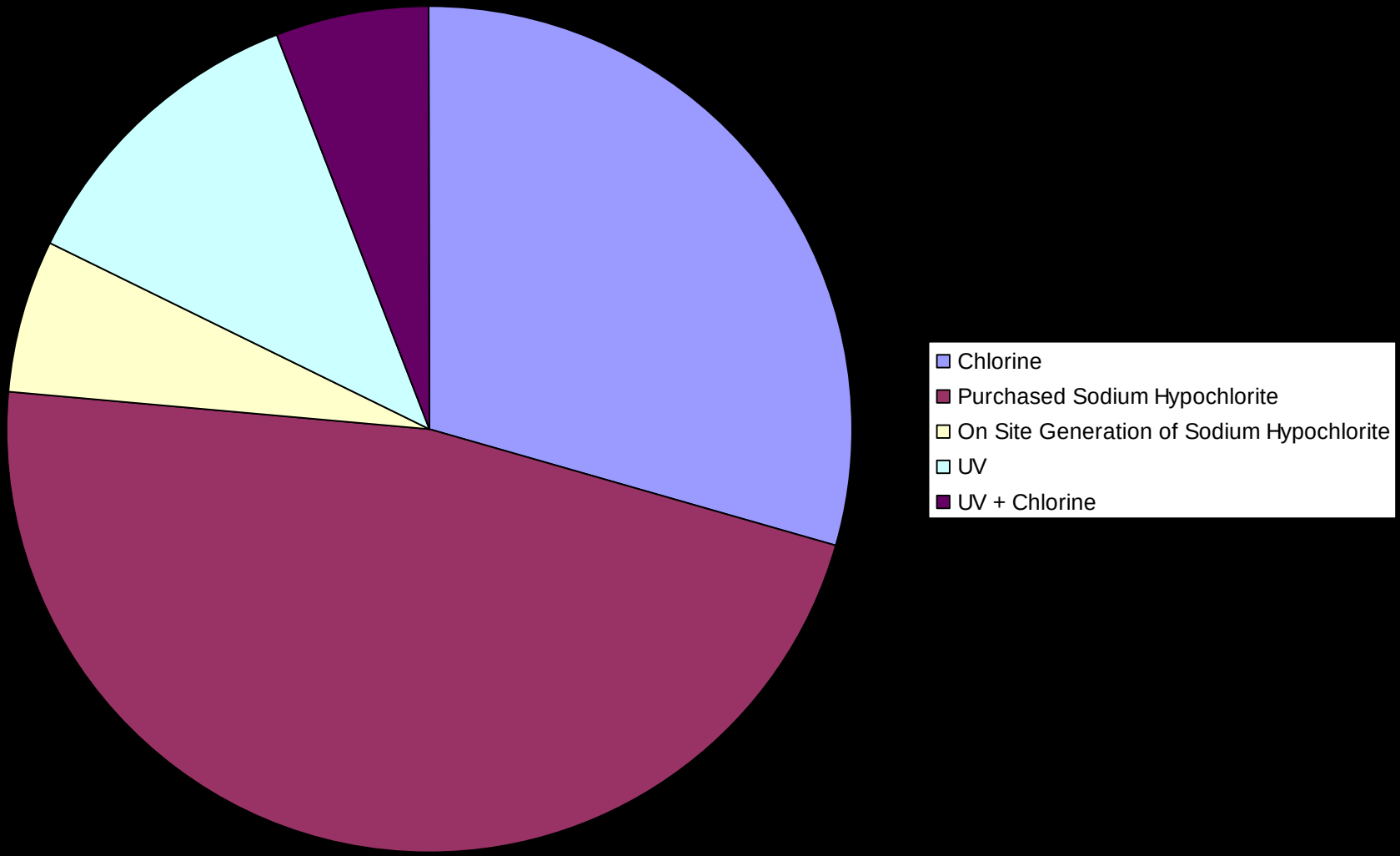
Post Conversion

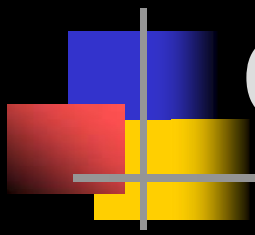
Post Conversion

National Trends

- Looked at counties serving 1 million plus people (17 facilities)
- Research findings based on available information on websites
- Trend is toward purchasing sodium hypochlorite

Summary of National Trends





Questions?